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Tetanus
Vol

An Inaugural Dissertation

On Tetanus

for the Degree of Doctor of Medicine

Submitted to the Examination of

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Section I.

The subject of this essay has engaged my attention, by the contrast, which it presents between the apparent magnitude of cause and effect. How trifling, oftentimes, are the remote causes of Tetanus? How formidable, how violent the disease? The wild irregularity of vital action is, in no instance, more striking in its form, nor more awful in its progress, than in true tetanic affection. Nature in such cases suffers the most intensive agony.

I take up this most violent of diseases, in order to inform myself more minutely respecting its nature and cure. If my inquiries among the authors, who have treated of it, will enable me to meet cases hereafter with better resources than I should otherwise possess, I shall have reason to think the time, spent in consulting them, has been happily employed.

The word tetanos is greek, from teino, I extend, I stretch out; and of course it literally signifies a tension, extension, or spasm. In medical language, tetanus being applied to the condition of living organs, denotes a spasm of the muscular system by which the body and members are extended, and by which rigidity and tension is produced in the muscles themselves.

This tetanus or spasm, affects, almost exclusively, the muscles, which are subservient to voluntary motion. The voluntary muscles are more universally affected with tension, in this, than in any other form of spasmodic disease. And they are also more permanantly affected, giving greater and more durable extension to the body. The greeks, therefore, may be considered to have applied the term tetanos very properly to a universal rigid spasm of the

voluntary muscles.

These early cultivators of medicine distinguished tetanus into several kinds, or varieties. These distinctions, which will afterwards be considered, have been very generally adopted by the Bayzantine physicians, by the Arabians, and by almost every modern who has written on this disease.

Section, II.

In giving a history of the form and symptoms of tetanus we may divide the course of the disease into three stages.

The first or forming stage is sometimes transient, but often of considerable duration. When it is the result of an alarm, fright or other violent emotion, its attack is sudden and severe. When it proceeds from an organic lesion, dampness, cold or organic irritability, it forms slowly, and arises gradually to its most violent state. The first stage commences with the earliest symptoms and continues untill rigidity is extended over the whole body.

When the disease proceeds from excessive emotion, it begins to form immediately, and the general rigidity is rapidly established. See the case related by Dr Rogers, and published in Dr Bartons Medical & physical Journal.

When it proceeds from cold the first symptoms are felt in two or three days; and when it arises from organic lesion is is usually several days before any tetanic symptoms are perceived; and these often set in when the injured part is free from pain, or even when it has intirely healed.

Dr Mosely observes, that after a wound or chirurgical opperation, in the West Indies, he never found any time untill the patient was intirely well,

exempted him from this disease.

The attack in every case commences with a slight tension at the ~~precon~~ precordia which is seen accompanied by stiffness of the back part of the neck. The uneasiness at the precordia, gradually increasing, at length amounts to severe pain. The stiffness of the neck renders it difficult to move the head. The jaws also become stiff. They cannot be moved without pain. A sense of stricture is perceived at the root of the tongue. A difficulty of swallowing takes place, which frequently terminates in a total interruption of deglutition. In this situation the patient refuses nourishment, as deglutition is not only painful in itself, but excites a return of the spasm.

The pulse is very different in different cases in this stage of the disease. Sometimes it is small and remarkably frequent; and sometimes slow and hard. The lower extremities, even before they are much affected with spasm, are feeble, and unable to give their usual support.

It is observed that the bowels are almost universally constipated.

The second stage commences with the extension of pain and rigidity to the extremities. In this period there is perhaps no voluntary muscle unaffected. Every part appears to sustain more or less of the burthen of disease. Obstinate watchfulness takes place. The patient however retains the free use of his intellects and senses; which serves only to make his situation the more miserable.

The sufferings of the patient go on increasing. He feels now and then a sudden, and most painful traction about the cartilago ensiformis, which tends towards the spine. This traction evidently depends upon a spasm of the diaphragm, and has been considered as the pathognemonic symptom of tetanus. The head is also drawn backward by a fixed contraction of the

posterior muscles. The pain at the præcordia returns every ten or fifteen minutes, and seems to bring along with it a stronger retraction of the head, and a more distressing pain of the neck, ascending to the occiput. This posterior pain, and spasm, extends instantly from the occiput and neck, along the spine, to the lower extremities. The whole body is extended, rigid and immovable; or convulsed and recurvated. The jaws are either fixed open, or as more commonly occurs, rigidly locked together. Any effort of the attendants to open the jaws, when locked, or to shut the mouth when it is fixed open, hurries on the general spasms, and subjects the patient to consummate agony.

In the violence of a paroxism the muscles of the whole body are ~~extremities are thrown~~ in the strongest degree contracted, and the body and extremities are thrown into new positions, which are governed by the superior force of the largest of them. The muscles of the jaws and neck, and the pectoral and deltoid muscles, display their great powers of action. The shoulders and breast are projected; the arms stretched out, or thrown across the body; and the hands either rigidly extended, or the fingers clinched.

The paroxism ceases in a few minutes, and though the patient still suffers from spasm and pain, he remains for a while comparatively relaxed and easy. After every paroxism respiration is hurried, as if from excessive exercise. The face is, in some instances, pale, but for the most part flushed during the ~~paroxism~~ remission of spasm. The countenance is expressive of the most melancholy distress.

The disease has now attained its utmost violence. The patient is constantly in torture; for the spasm, scarcely remitting for a minute, is more severe and continues longer, in every succeeding paroxism. As the power of different

ely in order in every different, and as they act in some or other necessarily in the assist. The ~~disease~~ paroxysm, the body is forced into various and highly painful situations. The belly is constricted and hard. The abdominal muscles do not yield to the descent of the diaphragm, which is wholly in a state of painful traction, giving no assistance in respiration. Such is the state of suffering during the second stage of the disease.

The third stage, in the worst cases or those which do not assume a convalescent crisis, is gradually established by an aggravation of all the violent symptoms, connected with a wishing of the more important functions of life.

The pulse bolters or the heart throbs with amazing frequency and irregularity, giving a peculiar palpitating motion to the epigastric region. The heat of the body diminishes. Articulation becomes indistinct; the sound of the voice is changed to a grating and horrible tone, in muttering. The eyes are watery and languid. Thirst ~~becomes~~ is insatiable, and the jaws are so fast locked, that drink or nourishment, even ~~brought~~ if they could be swallowed, cannot be introduced.

The exhausted sufferer enjoys no repose. Sometimes a transient coma occurring in the intervals has been mistaken for sleep; but genuine sleep is never enjoyed. A delirium more frequently than coma ensues; and this is connected with the wild and anxious consciousness of agony and despair.

There is frequently a suppression of urine; and liquor with difficulty, is in its urine the reader is compressed. As the disease draws to a close the tongue is sometimes violently thrust between the teeth. The forehead is corrugated, the eyes occasionally distorted, are commonly fixed or open.

in their sockets. The nose is drawn upwards; the cheeks backwards; and the entire countenance is made to assume a disagreeable, desponding and violent grin. In the midst of all these sufferings a sudden convulsion sometimes puts an end to life. Sometimes there is a gradual diminution of the pain and spasms, with a cold and universal sweat, before the mortal convulsion comes to relieve the victim of tetanus.

Tetanus was ably and minutely described by some of the older writers on medicine. Hippocrates in particular has given such ~~[illegible]~~ histories of this disease as evince the utmost accuracy of pathological observation.

Most of the ancient physicians had three varieties of tetanus in their books, but it is doubtful whether more than two very distinct ones exist in nature.

When the neck, body, and extremities were extended, straight, rigid, and inflexible, with the jaws locked, or the mouth fixed open - the affection was strictly called tetanus.

When more violent action took place in the voluntary muscles, the posterior ones, being the most powerful, would therefore bend the body backwards, like a bow, and produce what they termed opisthotonos. In this case the head is thrown back and remains immoveable, the anterior neck and thorax are projected forwards: a sudden increase of pain attended with a piercing scream elevates the abdomen, and the patient springs on his head and heels, so that the spine and hips form an arch in the air; he tumbles to either side; or is thrown by the force of the muscle or contraction with violence on the floor.

When the anterior muscles only were affected, the body pitched forwards, the disease was termed emprosthotonos, the existence of the opposite form of tetanus, or general spasm of the extensory muscles of the body, is not noticed in the descriptions of Hippocrates, as it should seem to have been a state that cannot exist. Tetanus with trismus may exist as a partial spasm, a spasm of some of the muscles of the neck in particular. But of the opisthotonos in general, the superior power of the posterior muscles acting as the tetanus, will not admit of a wending, towards.

Celsus in Celius Aurelianus distinguishes two theses, three methods, as has been enumerated. I think they must have confounded a partial affection, with the true varieties of general tetanus.

Celsus says, "Neque tamen alius importunior acutiorque morbus est "quam is qui quodam rigore nervorum, modo capite scapulis, modo mentum "pectori adnectit, modo rectum et immobilem cervicem intendit. Fit enim "qui opisthotonos inquiunt aut emprosthotonos aut tetanus "appellant."

Celius Aurelianus in his 8th chapter, treats of diseases has given a very minute description of the tetanus, under the general name of Nervous affection, after the Greeks, he divides it into three parts, more heavy than convulsions, and emprosthotonos. Tetanus in particular generally he defines to be an involuntary stretching and contraction of the with violent and acute pain from excessive tension. The terms Greek nervous of the disease Kapous pistergances, which literally means a freezing of the head underneath.

I shall notice this place that the various distinctions in the

[illegible] tetanic affection, invented by the [illegible] surgeons. [illegible] Lavager are calculated to produce [illegible] bullets are more [illegible] than are liable to injuries, [illegible] inspire.

When this disease arises from organic injury, though it does not [illegible] speedily after the accident, its course is rapid, calculating from the attack. Wilson observes, and his observations are confirmed by all who have [illegible] particularly acquainted with its history, that it [illegible] fatal in four [illegible] its fatal termination most frequently takes place on the fourth or fifth day. The much admired German writer just mentioned says, if the patient survives the fourth day, he must [illegible] Singers Hippocrates appears [illegible] to be no more correct; for many die on the fifth, seventh, and even [illegible] as the sixth day; and we know from the modern, as well as the [illegible] Hippocrates. The dangerous cases terminate very generally in proportion as the disease is [illegible] the fourth day.

Tetanus is a common and [illegible] in [illegible] climates. Hilly says he never saw a patient who had a [illegible] tetanus after an operation, but that he prevents the disease in many. The [illegible] of Hippocrates was no better, [illegible] resulting from wounds. Cases, however, shew in the sequel, that the disease arising from such accidents is not necessarily [illegible].

Section III.

It is unnecessary to dwell long on the causes of tetanus. An ample and highly interesting view of this part of the subject is taken by the learned [illegible] the [illegible] in the first volume of his [illegible]

[illegible] He says "all the [illegible] are [illegible] to be a cause of tetanus [illegible] is [illegible] preternatural [illegible] [illegible] irritability of the muscular parts [illegible]

[illegible] of medicine supposes that all spasm depends on spasm [illegible] and [illegible] that all diseases arising from the same [illegible] be cured by evacuations [illegible] those given in latter to regulate [illegible] support. There is little to be learned from such general dogmas, [illegible] either the pathology or cures of tetanus; nor with [illegible] in the inheritance attached to his [illegible] by a respectable [illegible] writer on [illegible] disease. See Hosack on tropical diseases.

A late writer on tetanus Dr Hamilton of Kilmarnock appears to think the precedent state of the intestinal canal is very intimately connected with the formation of the spasm. Every one observes that [illegible] influence [illegible] of the disease. Every one knows that irritating matters in the bowels induce great variety of spasms, as diseases like [illegible], hysteria, convulsions, epilepsy, [illegible] circumstances such as immunities, and which present themselves with great uniformity, "make it exceedingly probable" he says "that the functions of the stomach and intestines or materials derived from them, precedes the attack, and during the prevalence of tetanus"

The circumstance that tetanus is more frequent, in warm, than in cold climates, favours the sentiments of Dr Hamilton. The inhabitants of warm climates are by far more subject to intestinal spasm and costiveness than those of cold or temperate latitudes.

Dr Hosack observes in some part of his work that M. [illegible]

are remarkable for a habitual retention of the contents of the bowels. He says that it is customary with the women to have only one or two evacuations weekly. He remarks also that much larger doses of cathartics are requisite in order to open the bowels in the southern, than in the northern states of America. Barton's Lectures.

Section. IV.

The uncertainty of physicians in point of practice more precarious than in the treatment of tetanus. This is perhaps owing to their making no allowance for the difference of causes inducing it. Dr Rush ascribes the want of uniform success to the use of the same remedies without any respects to the nature of the cause which produced it, and to an unwarrantable reliance upon some one remedy under a belief of its specific efficacy.

Impressed with the truth of these sentiments, I feel encouraged to retrace what has been done by a number of remedies, and in various views of practice, in the expectation of ascertaining more clearly to my self, the best mode of treatment, under different states.

Venesection. This remedy has been serviceable both in the prevention and cure of this disease. Dr Rush found bleeding to be highly useful in tetanic affections, occurring in yellow fever patients.

And Dr Mosely states that frequent bleeding with purging and a raw diet, is the best preventive, in warm climates or in injuries of the head. He mentions the case of one Moosnel whom he supposes was saved by a large effusion of blood from his head in an operation for a fracture of the cranium. In this case the disease was not.

of other preventive but it was slight and the patient recovered.

Purgatives. Dr Rush paid no attention to the cause of the disease. If it depends in any degree on costiveness or the presence of worms, or an irritating material lodged in the bowels, appropriate purgatives become necessary agents. Perhaps there is no case of tetanus in which they should not be steadfastly employed; either by the mouth or by enemas. Even in cases of organic lesion, they may prove prophylactic if administered early, from the time of the accident so as to preserve an open state of the bowels. I have just noticed that the use of them, as prophylactics in union with bleeding, is commended by Dr Moseley. But I know of no writer who lays so much stress on the administration of purgatives as Dr Hamilton.

Dr Currie of Liverpool, says he gave great relief in two cases by the exhibition of laxative glysters.

The insight view which I have given of the state of the system at large, and particularly that of the primæ viæ in tetanus plead powerfully in favour of their use in the treatment of it. And so far as they have been employed it appears they have been useful.

Dr Moseley is judicious in recommending apperients or glysters, cooling medicine, a cool room, and a careful regimen, as preventives of the disease, after ~~surgical operations~~ accidents or surgical operations.

Emetics. These have been rarely resorted to as remedies for tetanic affection. Dr Rush says he "unlocked the jaws of a woman "who was seized at the same time with a remitting fever by "an emetic."

From what we know of the influence of emotion on the muscular system it was to be expected to prove of some utility in the disease under consideration. To procure that rest & peace from worrying which would be attempted by such agents as will exert a powerful influence on the system, may yet not attack the organization of the primæ viæ.

INCISION. Tetanus resulting from punctures, wounds, or slight injuries of tendinous parts, the knife has proved a speedy cure: "Whitness has known the opisthotonos in one night cured by extensive incision of the thumb by the throw of an orange fee. He thinks in such cases one of the principal measures for preventing the spasms is to intercept all communication between the sensorium commune and the injured part, by cutting across the tendon or making an incision quite down to the bone. It will seem, that the advantage from incision does not depend on cutting off the communication, but on giving a new state of action ~~to the parts~~, perhaps an inflammatory suppurative action, to the injured part. The common practice therefore is to enlarge the wound, or if it has nearly healed, to cut down into it, and at the same time make such application to it, as will tend speedily to excite suppuration. This plan of treatment, and every other local management, as scarrifying and amputating, too frequently fail. They are therefore to be attended in conjunction with other active remedies; but must on no account be relied on alone. Sometimes indeed incisions instantly remove the general disease; so that perhaps in the

* They might to prove useful by diverting action from the muscles to the, tum
ids, the, ts headaches, and other parts.

are afterwards necessary to complete the cure, unless a purgative to remove costiveness be considered as expedient.

Opium. This has been looked to as the anchor of hope by almost every modern physician, in the treatment of tetanus.

Opium is undoubtedly a proper remedy: but it is too often a fallible remedy. Of course it should never be utterly relied on: Ought to form a part of an extended plan of safety. Dr Lind of Haslers hospitals appears to have known no other remedy. He commends it in a full dose; but his full dose, is not a great one in tetanus: in one case he gave a scruple in less than twenty four hours. The stomach will sometimes bear, Dr Woseley, observes, a dram of opium every two hours without producing sleep or diminishing the violence of any symptom. Mr Winter adds, that he never found any benefit from a large quantity, where a small quantity had not first produced some evidently good effect: and elsewhere that there are many doubts whether a pound given alone, has ever been of any utility.

Wine. Dr Rush and Dr Currie have found wine highly useful when liberally employed. It has been tried by other physicians with good effect since these gentlemen gave their experience concerning it to the public. Tetanus has been cured by ardent spirits likewise. See Dr Rush's observations, &c.

Bark. Tonics of the most powerful kind, must prove as best favorably as invigorating, and, when they can be administered, curative agents. + Practice confirms what this theory requires: for Barks succeeded with most.

Essential oils. The oil of amber is thought to be a considerable antispasmodic. Dr Rush has seen the happiest effects from the exhibition of twenty eight drops every two hours in tetanus.

Balsams. Dr Kirkland has found the balsam of Peru of great efficacy in violent spasmodic diseases, arising from organic lesion. Medical Surgery. I think it would prove useful as a preventive remedy; in conjunction with mild purging medicines in true tetanus, but I would hardly expect a cure from it, when the disease is established. Dr Rogers used this most powerful balsam, in a violent case of epilepsy with happy effects: a circumstance in favour of its probable utility in tetanus. See Dr Bartons Journal.

Blistering. This is an old practice in tetanus. Celsus used the hot vinegar, air mixtures for the purpose. Blistering by cantharides is milder, but I doubt if it be a more efficacious method, than that of Celsus in this disease.

Mercury. The great powers of this medicine over many diseases has led Physicians to give it a trial wherever uncommon difficulties are met with in practice. It is therefore often employed in dangerous affections without any well grounded experience of its utility. In such cases it is thought to be the most promising of all agents for an experiment. Fortunately its various qualities renders it, not seldom, the just theme of applause. In tetanus, calomel, as a cathartic, ought to be of some utility. But any mercurial, employed to salivate, will only amuse the wishful receiver by the hope of a distant advantage, which he will never gain over the disease.

It may in some cases prove a useful auxiliary. Dr Rush saw a cure completed by a salivation. Dr Moseley is of opinion that Mercury used in tetanus has killed more people than it has cured.

Warm bath. The use of warm fomentations, the affusion of warm water, and immersion in the warm bath, are recommended by Celsus. Modern practice confirms the propriety of the last measure in particular cases. The warm bath is indicated by a small and very frequent pulse, or by a slow feeble one; by a low temperature of the surface and extremities; and by occasional faintings with sensations of chillness. It may perhaps be employed at any time when there is no febrile action present.

Cold bath or affusion. This was the favourite resource of Hippocrates. He says a fever with a white, thick urine is a critical fever. Epithetonos. He therefore advises pouring plenty of cold water on the patient, to restore the natural heat which cures the disease. He directs this practice to be followed every in the summer. The attention of Physicians was called to this remedy by Dr Wright, after it had been neglected. Dr Currie of Liverpool, having, many the way, by Dr Wright and Dr Cochrane of Leith, gave the cold bath a trial and was happy in the result.

Dr Rush employed the cold affusion with success, in a case arising from an injury done to one of the toes, by wearing a tight shoe.

Dr Girdlestone was uniformly successful with the cold bath in the East Indies.

Tobacco. As far as this remedy has had a trial, it has been attended with no small share of success. It promises to become one of the most valuable agents in the treatment of tetanus.

Tobacco was first used in tetanus by Dr Frederick May, when he was a student of medicine. He was directed, by his preceptor, Dr Warren, to give it a trial in a most violent case which arose from a wound. The injury in this case was produced by a nail just over the flexor tendon of the second toe. On the twelfth day the rigidity of the neck commenced. The tobacco was not tried, untill the disease was at its height, and after other means had entirely failed to mitigate the symptoms or check its career. He administered the medicine by way of enema. And gave it in the extraordinary dose of two ounces in decoction. It is possible the whole of the strength of this large quantity of tobacco was not extracted by half a pint of water; but saturated, as it must have been, the whole of the decoction thus exhibited, could not fail to produce great effects on the muscular system.

The next trial of tobacco, communicated to the public was in a case successfully treated by Dr Rogers. This case appeared in the Philadelphia Medical and Physical Journal, 1806 He gave the medicine in the form of enema; but in a much smaller dose than that of Dr May. Dr Rogers, without knowledge of Dr Mays success, prescribed one dram in decoction, in a very formidable case, which arose from violent agitation of mind. The second enema put a stop to the opisthotonic spasms and convulsion, and the patient recovered her usual health by the assistance of purgative medicines. —

Dr Rogers informs me that he has put an immediate stop to the spasms in another similar case, by a decoction of two drams in eight ounces of water, administered by enemas. I understand there have been other trials of tobacco in the disease of which we are treating: but I am ignorant ~~however~~ of the success attending them, as they have not been laid before the public.

The success of Dr Currie in epilepsy, by means of tobacco, indicates its power over the muscles. Its speedy operation as an emetic, in any way in which is presented to the prima via, also shews that it must greatly affect the muscles; for all emetics in full dose repeated affect them very considerably. It has been found to be in practice, what theory would expect, a most powerful antispasmodic or relaxer of muscular contraction. I trust it will prove a better and more certain remedy in this terrible disease than any hitherto employed in its treatment. ——